PATENT ABSTRACTS OF JAPAN

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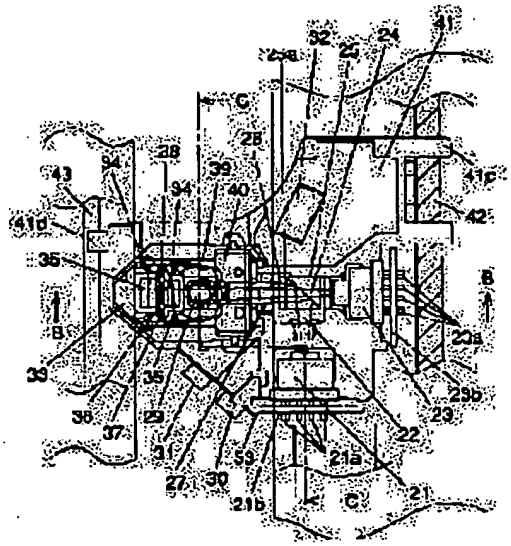
(54) OPTICAL PICKUP

(57)Abstract:
PROBLEM TO BE SOLVED: To make the optical pickup thin structive and miniature and also easily adjustable by disposing individual optical units and individual laser volumes in different planes respectively and also disposing these individual laser volumes in the same plane.
SOLUTION: This optical pickup is equipped with the optical units 21 and 23 as 1st and 2nd light sources, a carriage 41 mounted with these optical units 21 and 23 and the volumes 30 and 31 for adjusting the light sources of the optical units 21 and 23. The volumes 30 and 31 are disposed to be adjacent to the same side surface part of the carriage 41, whereas this diposing plane is different from any disposing planes of the optical units 21 and 23 of the 1st and 2nd light sources. Since the optical units 21 and 23 are formed integrally with a semiconductor laser for emitting laser light 24 for reproducing a disk and a diffraction grating for guiding reflected light, adjustment of an optical axis, etc., can be performed in each unit. Moreover, by providing the volume 30 and the volume 31 close to each other, an operating distance of a jig in their adjusting work can be shortened.



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CLAIMS

[Claim(s)]
[Claim 1] The optical pickup characterized by having had the carriage which carries the light source, the 2nd light source, and said the 1st light source and said 2nd light source, the 1st adjustment device which performs adjustment of said 1st light source, and the 2nd adjustment device which performs adjustment of said 2nd light source, and having arranged said the 1st adjustment device and said 2nd adjustment device on the side face of said carriage. [1st]
[Claim 2] The optical pickup according to claim 1 characterized by arranging said the 1st adjustment device and said 2nd adjustment device both in the 1st field of the side face of said carriage.
[Claim 3] The optical pickup according to claim 2 characterized by said 1st field differing from all of the field where the field where said 1st light source is arranged, and said 2nd light source are arranged.
[Claim 4] The 1st light source which is refreshable pickup about the 1st record medium and 2nd record medium with which recording density differs, and irradiates the light to said 1st record medium, The 1st light-receiving means which receives the light which it irradiated from said 1st light source, and has been reflected with said 1st record medium, The 1st optical unit equipped with said 1st light source and said 1st light-receiving means, The 2nd light-receiving means which receives the light which it irradiated from said 2nd light source, and has been reflected with said 2nd record medium, The 2nd optical unit equipped with said 2nd light source and said 2nd light-receiving means, The carriage which carries said 1st optical unit and said 2nd optical unit, The optical pickup characterized by having had the 1st adjustment device which adjusts said 1st light source, and the 2nd adjustment device which performs adjustment of the 2nd light source, and having arranged said the 1st adjustment device and said 2nd adjustment device on the side face of said carriage.
[Claim 5] The 1st connecting means which connects electrically the 1st terminal block prepared in said 1st optical unit, and said 1st adjustment device, The optical pickup according to claim 4 characterized by having had the 2nd connecting means which is prepared in said 2nd optical unit and connects electrically the 2nd terminal block and said 2nd adjustment device, and forming said the 1st connecting means and said 2nd connecting means in one flexible printed circuit.
[Claim 6] Claim 4 characterized by arranging said the 1st adjustment device and said 2nd adjustment device both in the 1st field of the side face of said carriage, an optical pickup given [any 1] in five.
[Claim 7] The optical pickup according to claim 6 characterized by said 1st field differing from all of the field where the field where said 1st light source is arranged, and said 2nd light source are arranged.
[Claim 8] An optical pickup claim 1 characterized by setting distance between the 1st adjustment device and the 2nd adjustment device to less than 10mm - given [any 1] in seven.

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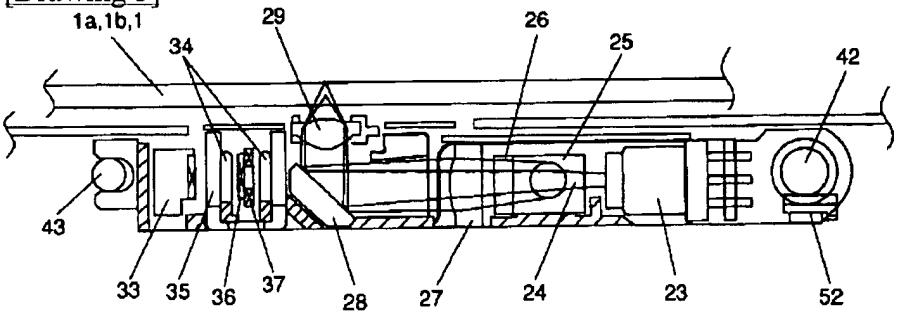
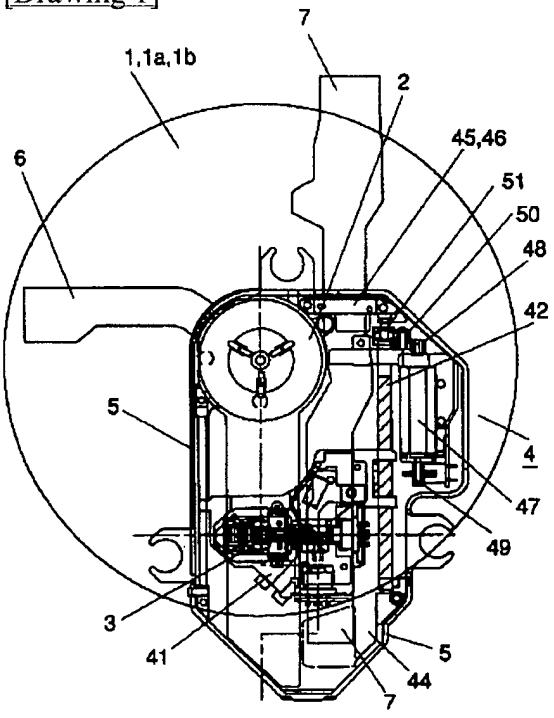
DRAWINGS

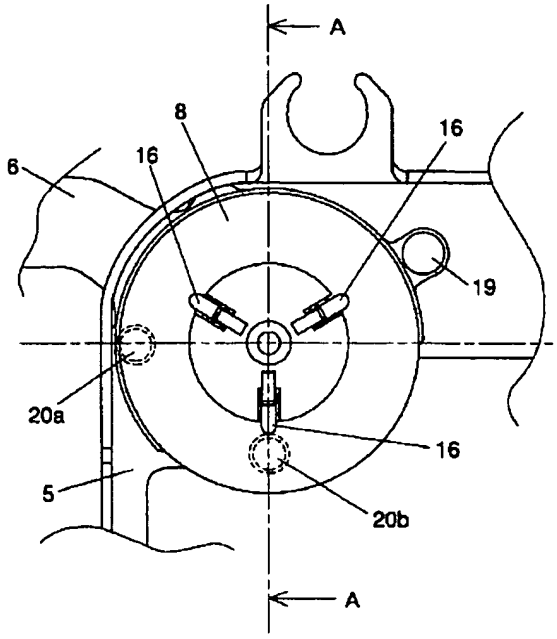
[Drawing 5]



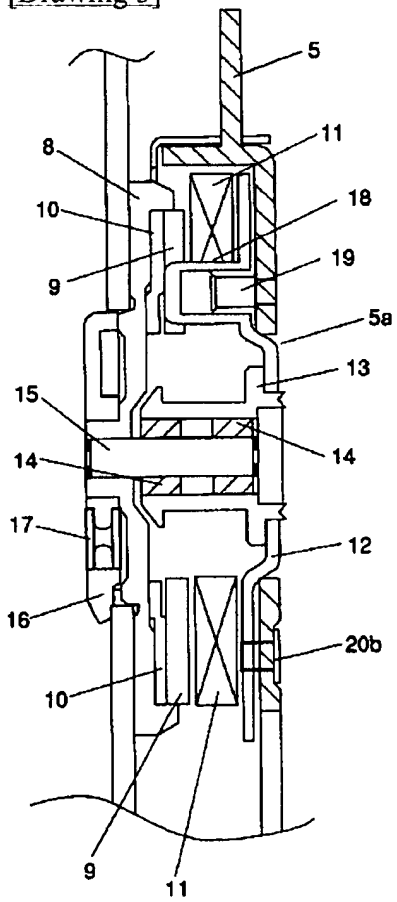
[Drawing 1]



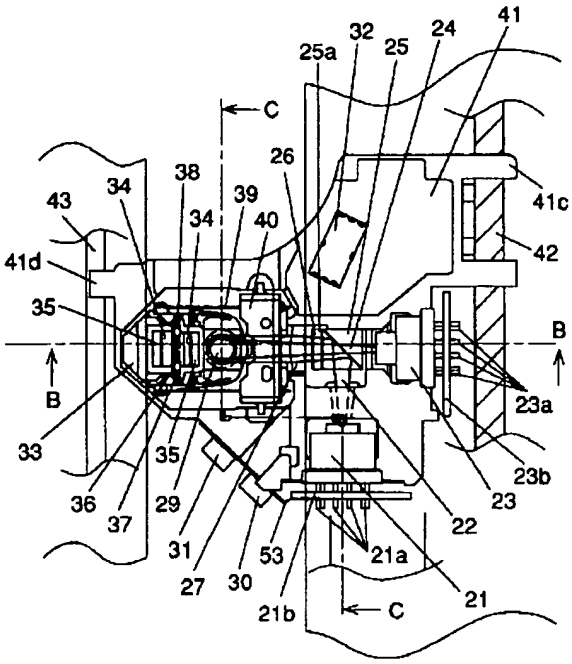
[Drawing 2]



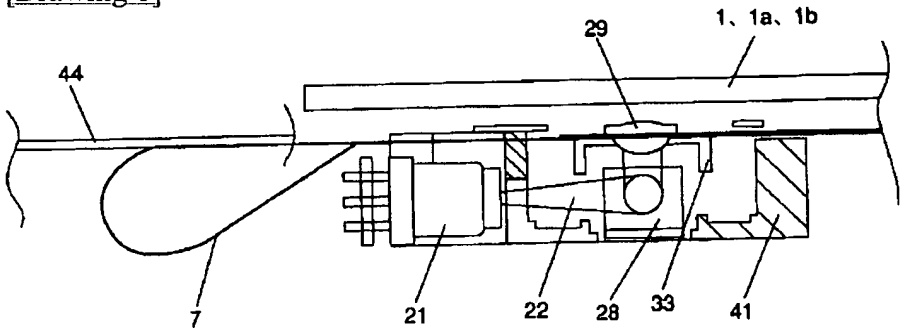
[Drawing 3]



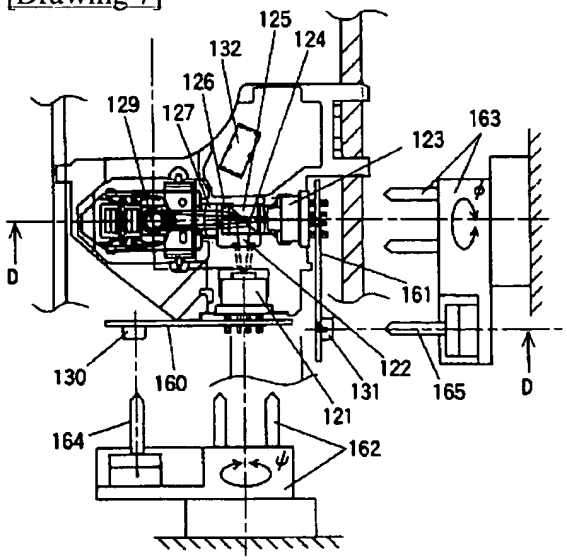
[Drawing 4]



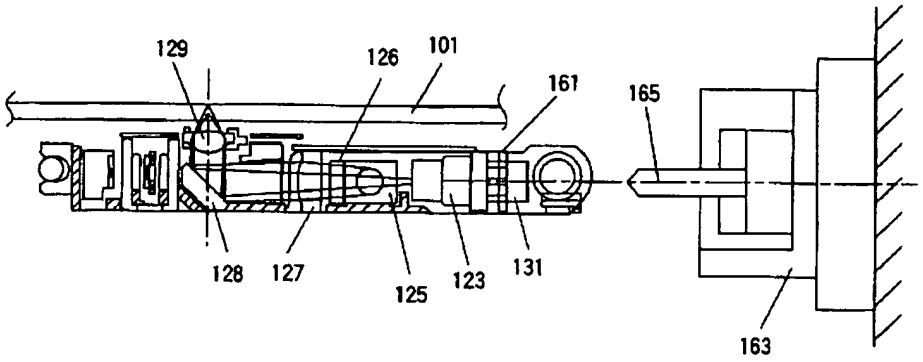
[Drawing 6]



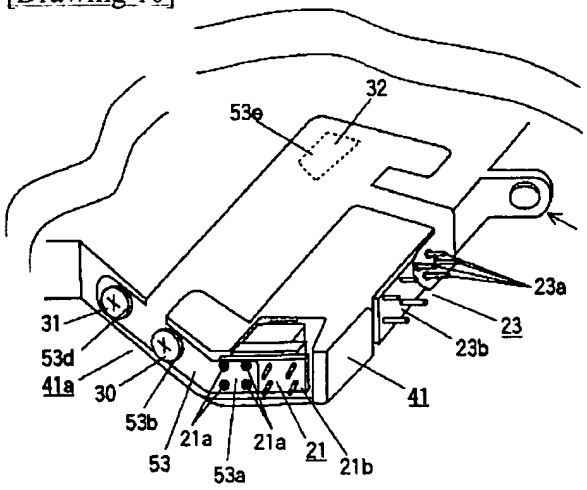
[Drawing 7]



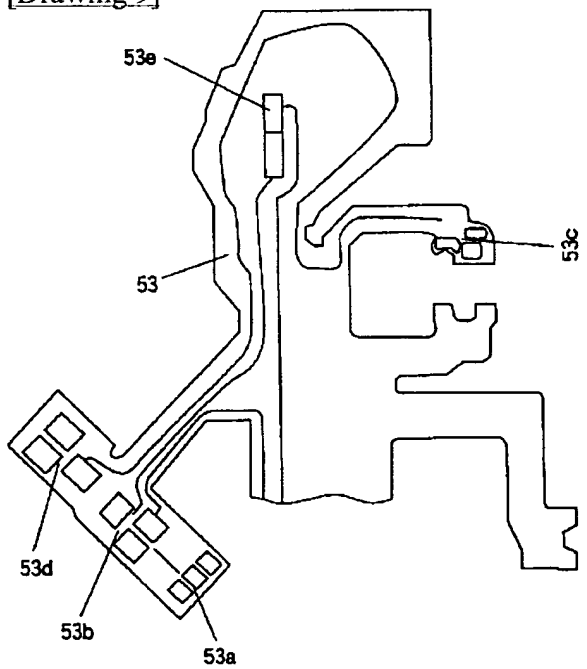
[Drawing 8]



[Drawing 10]



[Drawing 9]



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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the optical pickup used for the record playback in optical disks, such as a high-density disk and a compact disk.
[0002]
[Description of the Prior Art] The optical pickup which carries out record playback of a conventional high density record disk and a conventional compact disk is explained below. Drawing 7 is the front view of the conventional optical pickup section, and drawing 8 is DD sectional view of drawing 7 .
[0003] 130 is the volume for adjusting the laser outgoing radiation quantity of light of the semiconductor laser in the optical unit 121, and is attached on the laser substrate 160 fixed by means, such as soldering, on the optical unit 121. 131 is the volume for adjusting the laser outgoing radiation quantity of light of the semiconductor laser in the optical unit 123. It is attached on the laser substrate 161 fixed by means, such as soldering, on the optical unit 123. 132 is a superposition circuit for hanging superposition to the semiconductor laser light in the optical unit 121.
[0004] Thus, the constituted optical units 121 and 123 need to carry out rotation adjustment in the direction of phi, and the direction of psi respectively. Therefore, in order to perform adjustment of the arms 162 and 163 and rotation drive which carry out rotation adjustment as an adjustment facility, and volumes 130 and 131, revolving arms 164 and 165 are installed respectively. Moreover, since volumes 130 and 131 will also rotate if rotation adjustment of the optical units 121 and 123 is carried out, the revolving arm 165 and the rotation driving gear are constituted on the arm 163 in which a revolving arm 164 and a rotation driving gear carry out rotation adjustment on the arm 162 which carries out rotation adjustment.
[0005]
[Problem(s) to be Solved by the Invention] However, since the adjustment facility which performs rotation adjustment and volume adjustment of an optical unit becomes adjustment out of the same field, the configuration of said conventional optical pickup cannot make an optical unit and volume approach, and cannot perform the miniaturization of an optical pickup. Moreover, since volume adjustment was required on rotation adjustment of an optical unit, it had the trouble that an adjustment facility was complicated and facility costs increased.
[0006] This invention solves said conventional technical problem, it is a thin shape and adjustment aims at offering an easy optical pickup.
[0007]
[Means for Solving the Problem] The optical pickup of this invention arranged each optical unit and each laser volume in a different field, and arranged each volume in the same field.
[0008]
[Embodiment of the Invention] The carriage with which invention according to claim 1 carries the light source, the 2nd light source, and said the 1st light source and said 2nd light source, [1st] By having had the 1st adjustment device which adjusts said 1st light source, and the 2nd adjustment device which

performs adjustment of said 2nd light source, and having arranged said the 1st adjustment device and said 2nd adjustment device on the side face of said carriage It will contribute to thin shape-ization of a part and the whole optical pickup to which the projection of volume does not exist in the thickness direction of pickup, and realizing the thin drive equipment which is the needs of a commercial scene, it is almost without error and output adjustment of semiconductor laser can be ensured.

[0009] It becomes good with a small small facility of an operating distance also about the adjustment facility which operates a volume adjustment fixture while it can shorten working hours, since both invention according to claim 2 can shorten the operating distance of the fixture for volumes in the output tuning of semiconductor laser by arranging said the 1st adjustment device and said 2nd adjustment device in the 1st field of the side face of said carriage. Therefore, while being able to raise productivity, a facility configuration can be simplified, while appearing notably about the effectiveness that a production cost can be reduced, it will contribute to thin shape-ization of the whole optical pickup, and the operation effectiveness of becoming easy to realize the thin drive equipment which is the needs of a commercial scene can also be acquired.

[0010] Invention according to claim 3 can perform output adjustment of semiconductor laser also to the midst which is adjusting the hand of cut of an optical unit, when said 1st field differs from all of the field where the field where said 1st light source is arranged, and said 2nd light source are arranged. That is, since two activities can be done by the concurrency at a stretch, the working hours which the assembly of an optical pickup takes can be shortened, and a manufacturing cost can be reduced.

[0011] The 1st light source which invention according to claim 4 is refreshable pickup about the 1st record medium and 2nd record medium with which recording density differs, and irradiates the light to said 1st record medium, The 1st light-receiving means which receives the light which it irradiated from said 1st light source, and has been reflected with said 1st record medium, The 1st optical unit equipped with said 1st light source and said 1st light-receiving means, The 2nd light-receiving means which receives the light which it irradiated from said 2nd light source, and has been reflected with said 2nd record medium, The 2nd optical unit equipped with said 2nd light source and said 2nd light-receiving means, The carriage which carries said 1st optical unit and said 2nd optical unit, By having had the 1st adjustment device which adjusts said 1st light source, and the 2nd adjustment device which performs adjustment of the 2nd light source, and having arranged said the 1st adjustment device and said 2nd adjustment device on the side face of said carriage The 1st connecting means which connects electrically the 1st terminal block by which invention according to claim 5 was prepared in said 1st optical unit, and said 1st adjustment device, By having had the 2nd connecting means which is prepared in said 2nd optical unit and connects electrically the 2nd terminal block and said 2nd adjustment device, and having formed said the 1st connecting means and said 2nd connecting means in one flexible printed circuit Since the bending of FPC and generating of bending by actuation of carriage can be controlled, generating of malfunctions, such as an open circuit and contamination, can consider as an optical pickup with little high dependability.

[0012] It becomes good with a small small facility of an operating distance also about the adjustment facility which operates a volume adjustment fixture while it can shorten working hours, since both invention according to claim 6 can shorten the operating distance of the fixture for volumes in the output tuning of semiconductor laser by arranging said the 1st adjustment device and said 2nd adjustment device in the 1st field of the side face of said carriage. Therefore, while being able to raise productivity, a facility configuration can be simplified, while appearing notably about the effectiveness that a production cost can be reduced, it will contribute to thin shape-ization of the whole optical pickup, and the operation effectiveness of becoming easy to realize the thin drive equipment which is the needs of a commercial scene can also be acquired.

[0013] Invention according to claim 7 can perform output adjustment of semiconductor laser also to the midst which is adjusting the hand of cut of an optical unit, when said 1st field differs from all of the field where the field where said 1st light source is arranged, and said 2nd light source are arranged. That is, since two activities can be done by the concurrency at a stretch, the working hours which the assembly of an optical pickup takes can be shortened, and a manufacturing cost can be reduced.

[0014] By having set distance between the 1st adjustment device and the 2nd adjustment device to less than 10mm, invention according to claim 8 can shorten a fixture operating distance further, and can also miniaturize an adjustment facility further.
[0015] It explains referring to a drawing about the gestalt of 1 operation of this invention below. Drawing 1 is the front view of the optical pickup in the gestalt of 1 operation of this invention. In drawing 1 , 1 is a disk and uses low consistency disk 1b, such as high-density disk 1a, such as a digital videodisc (it omits Following DVD), or a compact disk (it omits Following CD), as a disk 1 in the gestalt of this operation. It is the disk of a configuration of having prepared two substrates which have a recording layer as high-density disk 1a here, and having made the two substrates rival etc. Although 2 is explained in full detail later in the spindle motor section which rotates a disk 1, it also has the device which clamps a disk 1. 3 is explained in full detail later in the optical pickup section which performs record playback on a disk 1. 4 is the feed section which makes a disk 1 move the optical pickup section 3 to inner circumference and a periphery. 5 is the module base in which the spindle motor section, the optical pickup section, and the feed section are carried. 6 and 7 are flexible substrates which supply power to a spindle motor and the optical pickup section.
[0016] Hereafter, the front view of the optical pickup in the front view of the spindle motor section in the gestalt of the 1 operation of this invention to drawing 2 , AA sectional view of drawing 2 in the gestalt of the 1 operation of this invention to drawing 3 , and the gestalt of the 1 operation of this invention to drawing 4 , BB sectional view of drawing 4 in the gestalt of the 1 operation of this invention to drawing 5 , and CC sectional view of drawing 4 in the gestalt of the 1 operation of this invention to drawing 6 are shown.
[0017] In drawing 2 - drawing 3 , the disc-like turntable on which 8 positions a disk 1 with a sufficient precision, and 9 are ring-like permanent magnets, and the permanent magnet 9 forms N magnetic pole and S magnetic pole by turns on a periphery, respectively. For example, S magnetic pole is arranged among four N magnetic poles, respectively, and, moreover, the include angle between each magnetic pole is arranged at intervals of about 45 degrees. In this case, as a magnetic pole, it consists of eight. In the case of the gestalt of this operation, the number of magnetic poles was set to 8, but constituting in 4-16 is desirable. Obtaining is difficult for the rotation too stabilized by being unable to obtain the rotation stabilized as the number of magnetic poles is three or less, but the magnetism when magnetizing that the number of magnetic poles is 13 or more becoming small too much.
[0018] 10 is a sheet metal and a sheet metal 10 is used as York of a permanent magnet 9. Moreover, the sheet metal 10 is adhesion or really being fixed to the turntable 8 with the means of shaping etc. At this time, the plate which consisted of ferromagnetic ingredients may be used instead of a sheet metal 10. In addition, in order to enlarge the magnetism of a permanent magnet 9 in the case of the gestalt of this operation, the sheet metal 10 was formed, but when you do not need the magnetism of a permanent magnet 9 so much, it is not necessary to form a sheet metal 10.
[0019] Furthermore, a permanent magnet 9 and a sheet metal 10 may be formed in one, and a turntable 8, a permanent magnet 9, and a sheet metal 10 may be formed in one. Thus, by making three members into one, a member can be miniaturized and thin shape-ization of equipment can be performed.
[0020] 11 is the spindle coil constituted by arranging two or more coil groups annularly, and the spindle coil 11 consists of a number of coils which counter a permanent magnet 9 and are different from the number of magnetic poles of a permanent magnet 9. At this time, it is more desirable than the number of magnetic poles of a permanent magnet 9 to lessen the number of coils. Moreover, each coil group is making the shape of an abbreviation triangle, and the coils which have moreover countered are connected to the serial. Since the number of magnetic poles of a permanent magnet 9 is set to 8 in the case of the gestalt of this operation, the spindle coil 11 is constituted by arranging 6 coils annularly. In addition, although six coils have been annularly arranged with the gestalt of this operation, constituting in 4-12 is desirable.
[0021] 12 is the base sheet metal used as opposite York of a permanent magnet 9, and has established the diaphragm which has a taper side in part near the center. Moreover, the metal housing 13 is being fixed to the part of a diaphragm with the means of caulking etc., and the metal housing 13 is

perpendicularly stood to the base sheet metal 12. Although the base sheet metal 12 was constituted from a sheet metal at this time, ******** is also good at the plate which consists of a ferromagnetic ingredient. In addition, the spindle coil 11 is arranged through the flexible printed circuit board which is not illustrated in the shape of base sheet-metal 12. This flexible printed circuit board that is not illustrated has predetermined wiring structure, and this wiring and the spindle coil 11 are connected electrically, and a current is passed as rotated in a turntable 8 in the spindle coil 11.

[0022] 14 is sinking-in metal and the sinking-in metal 14 is being fixed to the interior of the metal housing 13 with means, such as the thick close one. The sinking-in metal 14 is small, and very much, since lubricity is good and is moreover low friction, it is especially used for a thin drive suitably. With the gestalt of this operation, although the sinking-in metal 14 has been arranged to the both ends inside the metal housing 13, respectively, in consideration of an operating environment etc., at least one sinking-in metal and three sinking-in metal or more may be arranged in the metal housing 13. Furthermore, with the gestalt of this operation, although sinking-in metal was used, other bearings may be used.

[0023] 15 is a spindle shaft and, as for the spindle shaft 15, thick close immobilization of the other end side is carried out for the end face on the spherical surface at the turntable 8.

[0024] 16 is the deformation ball which clamps a disk 1, and the deformation ball 16 is always energized in the direction of a periphery of a disk 1 with the clamp spring 17. The disk 1 is the device which always ****-ga-starts a turntable 8 side, and is clamped according to this energization force. Moreover, in case a disk 1 is removed, the deformation ball 16 is removed, making the clamp spring 17 compress into the inner circumference side of a disk 1.

[0025] Module base hole 5a of the approximate circle configuration in which a part for the converging section of the base sheet metal 12 is inserted is formed in the module base 5, and the base sheet metal 12 has come to be able to carry out a skew within the limits of module base hole 5a within module base hole 5a in tangential one and a radial direction. That is, it is constituted so that the spindle shaft 15 may be set up at an angle of predetermined to the module base 5 at the time of manufacture. Thus, by constituting, it is the device which comes to be able to carry out the skew of the disk 1 to tangential one and a radial direction. That is, by performing the above adjustments, distance of a disk 1 and an optical pickup can be mostly made regularity, and good playback can be performed.

[0026] While, as for 18, a skew spring is inserted and, as for 19, the skew spring 18 is inserted, it is the fixed screw which penetrated the base sheet metal 5 and was fixed to the module base 5. The skew spring 18 is being fixed to the fixed screw 19 so that the base sheet metal 12 may be inserted with the module base 5, and moreover, the skew spring 18 is energizing the base sheet metal 12 at the module base 5.

[0027] 20a and 20b are the stretching screws for making the skew of the base sheet metal 12 carry out in a radial direction and the tangential direction to the module base 5, and skew adjustment is performed by fastening or loosening this stretching screw. These stretching screws 20a and 20b penetrate the module base 5, respectively, and are thrust into the base sheet metal 12. Skew adjustment inserts the skew spring 18 in the fixed screw 19, and makes the base sheet metal 12 penetrate the fixed screw 19 first, and fixes the fixed screw 19 to the module base 5. Thus, by constituting, the skew spring 18 energizes the base sheet metal 12 at the module base 5 as mentioned above. Next, the skew of a radial direction and the tangential direction is adjusted for the sheet-metal base 12 to the module base 5 by rotating stretching screws 20a and 20b. Since the base sheet metal 12 is being fixed to the module base 5 with the fixed screw 19 at this time, it seems not to displace the base sheet metal 12 by rotating stretching screws 20a and 20b, but since the base sheet metal 12 is only energized by the module base 5 with the skew spring 18, it can displace the base sheet metal 12 by some within the limits.

[0028] Below, about the optical system of the optical pickup of this invention, CD is mentioned as an example for DVD as low consistency disk 1b as high-density disk 1a, and two or more disks with which classes differ are explained about a refreshable optical pickup.

[0029] In drawing 4 - drawing 6 , 21 is an optical unit and the optical unit 21 constitutes in one the photodetector (not shown) equipped with the semiconductor laser which carries out outgoing radiation

of the laser beam 22 with a wavelength of 635-650nm which reproduces high-density disk 1a, the diffraction grating (not shown) which leads the reflected light from high-density disk 1a to a detector, and two or more photo detectors which receive the light from the diffraction grating.
[0030] As for the optical unit 23, 23 constitutes in one the photodetector (not shown) equipped with the semiconductor laser which carries out outgoing radiation of the laser beam 24 with a wavelength of 780nm which reproduces low consistency disk 1b, the diffraction grating which generates three beams from a laser beam 24, the diffraction grating (not shown) which leads the reflected light from low consistency disk 1b to a detector, and two or more photo detectors which receive the light from the diffraction grating from an optical unit.
[0031] Thus, since optical-axis adjustment which was being performed for every optical member until now by using for an optical pickup the optical unit 21 and the optical unit 23 which were unified can be performed per unit, the routing counters and time amount which adjustment takes are sharply reducible. Furthermore, since it can adjust per unit unlike adjusting each of small optical members, the handling nature at the time of adjustment can improve sharply, and while being able to perform more exact installation, it can attach, and generating of the location gap at the time can also be decreased greatly.
[0032] Moreover, by having considered as one optical unit to each semiconductor laser Optimal arrangement according to each semiconductor laser can be performed [be / it / under / each optical unit / setting]. Furthermore, the separate diffraction grating from which a configuration differs for every unit so that the optimal focal tracking which was adapted for the disk to play can be performed can be prepared. In addition, since it can form in the configuration which can form the RF signal and the focal tracking signal which are used as optimal approach for every disk also about a detection means beforehand An optical disk unit with the sufficient engine performance which can perform detection of a signal and control of pickup with high degree of accuracy very much is realizable.
[0033] And the light source unit 21 and the light source unit 23 are arranged so that the laser beam 24 by which outgoing radiation is carried out from the optical axis and the optical unit 23 of the laser beam 22 by which outgoing radiation is carried out from the optical unit 21 may intersect perpendicularly mostly mutually. And it is constituted so that the light by which has arranged the core of the beam splitter 25 which penetrates a laser beam 24 mostly at the flat surface including the intersection of the optical axis of the laser beam 22 from said optical unit 21 and the optical axis of the laser beam 24 from the optical unit 23 while reflecting the laser beam 22 mostly, and outgoing radiation was carried out from a different location may be drawn on the almost same optical axis.
[0034] Since the optical member after being led on the same optical axis by considering light from the semiconductor laser arranged in such a different location as arrangement on an abbreviation same optical axis is sharable, the components mark of optical members, such as an objective lens, can be reduced, and improvement in productivity and reduction of a production cost can be aimed at. Moreover, since the factor which worsens optical properties, such as aberration generated in the light by which outgoing radiation was carried out from each semiconductor laser by having shared the optical path, will also exist almost in common, ********, such as aberration which it has before each light by which outgoing radiation was carried out from each semiconductor laser carries out incidence to an objective lens 29, can be made almost equivalent. Therefore, the light from two or more semiconductor laser with one objective lens 29 can be more easily completed now as an optical disk 1.
[0035] Furthermore, the wavelength filter 26 is arranged at the optical outgoing radiation side 25a side of a beam splitter 25. This wavelength filter 26 has the transparency field which penetrates any light of wavelength, and the selection transparency field which covers the light of specific wavelength. It is the field which makes each penetrate the laser beam 22 by which a transparency field is irradiated by the high-density disk, and the laser beam 24 irradiated by the low consistency disk especially in the gestalt of this operation. It is what a selection transparency field penetrates mostly the laser beam 22 irradiated by high-density disk 1a, and hardly penetrates the laser beam 24 irradiated by low consistency disk 1b. The configuration of a selection transparency field is formed so that the configuration demanded in case the laser beam 24 irradiated by the low consistency disk 24 carries out incidence to an objective lens 29 can be realized. In the gestalt of this operation, it is formed so that the numerical aperture of an objective

lens may specifically be set to 0.43-0.45.
[0036] This wavelength filter 26 is formed in base ingredients, such as optical glass, in many cases, when it is formed using dielectric materials and forms by the beam splitter 25 and another member, combining by turns the dielectric materials which have a high refractive index, and the dielectric materials which have a low refractive index. And it is fixed to optical outgoing radiation side 25a of a beam splitter 25 by means, such as adhesion. Moreover, forming in a beam splitter 25 beforehand is also considered, and a dielectric film is beforehand formed in the field used as optical outgoing radiation side 25a of the substrate directly by approaches, such as sputtering and vacuum evaporationo, in the phase of the substrate before forming the prism which has optical outgoing radiation side 25a of a beam splitter 25 in that case.
[0037] Since degradation of the optical property by existence of the glue line formed in case the wavelength filter 26 is formed in a beam splitter 25 can be controlled while being able to consider as an optical pickup with high productivity, since it can be made to decrease like the fitter of an optical member when having formed beforehand especially, a good optical property is especially realizable.
[0038] In addition, the target effectiveness can be acquired wherever it may arrange, if the arrangement location of the wavelength filter 26 is between a beam splitter 25 and an objective lens 29.
[0039] Incidence of the laser beam 22 and laser beam 24 which passed the wavelength filter 26 is carried out to the collimator lens 27 prepared if needed, and emission light is made more into a small light of whenever [emission], or abbreviation parallel light, they pass opening (not shown) prepared in the suspension holder 40, are changed by the starting mirror 28 in the direction of an optical axis, and are condensed by the optical disk 1 with an objective lens 29. When a laser beam 22 carries out incidence of the objective lens 29, it condenses the light to the recording surface of high-density disk 1a, and when a laser beam 24 carries out incidence, it is formed here so that the light may be condensed to the recording surface of low consistency disk 1b. The objective lens 29 is set up so that the laser beam 22 which has wavelength with a wavelength of 635-650nm may be condensed to the recording surface of DVD currently formed by the substrate thickness of 0.6mm, and it may become numerical aperture 0.6, and thereby, a laser beam 22 makes about 1 micrometer condense it in the gestalt of this operation. Moreover, the laser beam 24 whose wavelength which penetrated the wavelength filter 26 is 780nm of abbreviation is set up by this objective lens 29 so that it may condense to the recording surface of CD currently formed by 1.2mm in substrate thickness, and thereby with it, a laser beam 24 is condensed by about about 1.2-1.5 micrometers.
[0040] Thus, since the configuration of the incident light in an objective lens 29 can be optimized by using combining the wavelength filter 26 and an objective lens 29 and the condensing location according to each optical disk 1 and magnitude of a condensing spot can be realized, it becomes possible to condense the light of two or more semiconductor laser on the optical disk 1 with which classes differ using one objective lens.
[0041] Arrangement of the optical unit 21 is installed so that the location of the semiconductor laser with which playback of high-density disk 1a prepared in the unit is presented may serve as abbreviation parallel light after collimator lens 27 passage, and a laser light source with a wavelength of 780nm arranges arrangement of the optical unit 23 in the location which becomes close to an objective lens 29 rather than the semiconductor laser which is said wavelength of 635-650nm. For example, if optical-path distance in the air length of semiconductor laser with a wavelength [of 635-650nm] and a wavelength of 780nm and an objective lens 29 is set to L1 and L2, respectively, arrangement of the optical unit 23 of semiconductor laser loading with a wavelength of 780nm in the range of $0.55 <= L2/L1 <= 0.75$ will be set up.
[0042] Since both the amounts of aberration generated in the laser beam 22 and the laser beam 24 by arranging semiconductor laser in such range at the time of objective lens 29 incidence can be made below into a tolerance value, an optical property good about both light can be obtained, and since record and reproducing characteristics good [a / high-density disk 1] also about low consistency disk 1b are realizable, it is a desirable configuration.
[0043] Here, although not illustrated, the diffraction grating of the field where the diffraction grating of

the optical unit 21 was trichotomized, and the optical unit 23 consists of a 2 division field. Moreover, the photodetector of a configuration of that the quadrisection photo detector has been arranged at the core and the optical unit 21 prepared the photo detector in the both sides and the optical unit 23 consist of photodetectors which consist of a 5 division photo detector. Moreover, the direction of the semiconductor laser in the optical unit 21 is attached so that the direction of a major axis of the far field pattern of a laser beam 22 may become the radial direction of a high-density disk 1, and parallel. The cross talk generated between the pits which adjoin by this can be prevented efficiently. Moreover, when using the 3 beam method as the tracking approach, the sense of the optical unit 23 is arranged so that the three beams may carry out an abbreviation rectangular cross with the radial direction of a disk 1.

[0044] Any of two semiconductor laser which exists in optical system with the gestalt of this operation are made to emit light switches according to whether the disk 1 recorded and played is high-density disk 1a or it is low consistency disk 1b. That is, when high-density disk 1a is laid as an optical disk 1, the semiconductor laser prepared in the optical unit 21 is operated, a laser beam 22 is irradiated, when low consistency disk 1b is laid as an optical disk 1, the semiconductor laser prepared in the optical unit 23 is operated, and a laser beam 24 is irradiated.

[0045] Next, the actuation in the case of playing DVD with a substrate thickness of 0.6mm and CD with a substrate thickness of 1.2mm especially about the playback actuation in the optical disk with which recording density differs from substrate thickness is explained, respectively.

[0046] When reproducing the signal with a thickness of 0.6mm of high-density disk 1a, after penetrating a diffraction grating and being reflected by the beam splitter 25, the laser beam 22 with a wavelength [from the semiconductor laser prepared in the optical unit 21] of 635-650nm penetrates the wavelength filter 26, a collimator lens 27, and the starting mirror 28, and they carry out incidence to an objective lens 29. Image formation of the laser beam 22 which carried out incidence to the objective lens 29 is carried out to the recording surface (located in 0.6mm of abbreviation from a substrate front face) of high-density disk 1a in a condensing operation of an objective lens 29. After penetrating an objective lens 29, the starting mirror 28, a collimator lens 27, and the wavelength filter 26 again and being reflected by the beam splitter 25, incidence of the reflected light from high-density disk 1a is carried out to a diffraction grating. The light which carried out incidence to the diffraction grating is diffracted in the trichotomy field of a diffraction grating, respectively, and reaches a photodetector. in the above actuation, a RF signal is detected from the total which transformed into the voltage signal the current output detected by 6 division photo detector, and a focal error signal uses the primary diffracted light from the semicircle field of a diffraction grating -- it is -- **** hologram Foucault -- it detects by law. A tracking error signal is detected by changing the voltage output by each primary diffracted light of 2 division field of a diffraction grating into a digital wave with a comparator, respectively, and changing the pulse according to those phase contrast into an analog wave through an integrating circuit.

[0047] When reproducing the signal of low consistency disk 1b, in performing especially a tracking error signal by the 3 beam method Separate into three beams by the diffraction grating (not shown), and the laser beam 24 of 780nm of wavelength abbreviation from the semiconductor laser prepared in the optical unit 23 penetrates a diffraction grating. After penetrating a beam splitter 25 and penetrating the approximate circle configuration part for a core of the wavelength filter 26, Incidence is carried out to a collimator lens 27, the starting mirror 28, and an objective lens 29, and image formation is carried out to the recording surface (located in 1.2mm of abbreviation from a substrate front face) of low consistency disk 1b in a condensing operation of an objective lens 29.

[0048] The reflected light from low consistency disk 1b penetrates the approximate circle configuration parts for a core of an objective lens 29, the starting mirror 28, a collimator lens 27, and the wavelength filter 26, and a beam splitter 25 again, and they carry out incidence to a diffraction grating. The light which carried out incidence to the diffraction grating is diffracted, reaches a photodetector, and detects a signal. detecting a RF signal from the total which transformed into the voltage signal the current output detected by 5 division photo detector, a focal error signal uses the primary diffracted light from the field of the one half of a diffraction grating -- it is -- **** hologram Foucault -- it detects by law. A tracking error signal is detected by the 3 beam method.

[0049] Although the above is the approach used with the gestalt of this operation, it is also possible to use the approach which is not limited to this and is already learned about both the RF signal the focal error signal and the tracking error signal.
[0050] Moreover, although the case where two semiconductor laser is used in the gestalt of this operation has been explained, also when playing two or more disks with which three or more classes differ, for example like a high-density disk, a semi-gross density disk, and a low consistency disk, and arranging three or more, it thinks. In that case, an optical unit may be formed for every semiconductor laser, and you may make it assign two or more semiconductor laser to two optical units. Moreover, it is desirable to have the second and third selection transparency field further corresponding to [in addition to the transparency field and the selection transparency field in this case] the wavelength of each semiconductor laser in the wavelength filter 26.
[0051] Moreover, in the gestalt of this operation, although the wavelength of the semiconductor laser to be used considered DVD and CD and used the 635-650nm thing and the 780nm thing, it is good also as 400-430nm and 635-650nm, and can also be increased further if needed well also as three, 780 morenm, 635-650nm, and 400-430nm, for example.
[0052] Moreover, arrangement of the optical unit 21 and the optical unit 23 may be exchanged on the conditions with which were satisfied of said range of 0.55 <=L2/L1 <=0.75. Furthermore, s deviation component of the laser beam 22 with a wavelength of 635-650nm is reflected instead of a beam splitter 25, and the deviation beam splitter which penetrates p deviation component of the laser beam 24 with a wavelength of 780nm may be used. Moreover, the laser beam wavelength of the optical unit 21 may be changed into the short-wavelength-laser light corresponding to the rec/play of a high-density disk.
[0053] Next, the volume which adjusts the outgoing radiation quantity of light of the semiconductor laser in the gestalt of 1 operation of this invention is explained.
[0054] 30 is volume, the laser intensity of the semiconductor laser in the optical unit 21 is adjusted, and it is prepared in lateral portion 41a of carriage 41, and it is formed [whose volume 30 is] like the variable resistance which is made to rotate a screw or a tongue of + or - etc., and changes resistance in many cases. And it connects with the thing concerning control of the semiconductor laser of two or more terminal 21a with which business prepared in the pars basilaris ossis occipitalis of the optical unit 21, such as an electric power supply and signal ejection, is presented electrically through circuit board 21b and a flexible printed circuit board 53 (it omits the following FPC 53).
[0055] It is in a thing like [31 is volume and] the variable resistance which is prepared so that the volume 30 which volume 31 adjusts the laser intensity of the semiconductor laser in the optical unit 23, and was mentioned above in lateral portion 41a of carriage 41 may be adjoined, is made to rotate a screw or a tongue of + or - etc., and changes resistance, and is formed in many cases. And it connects with the thing concerning control of the semiconductor laser of two or more terminal 23a with which business prepared in the pars basilaris ossis occipitalis of the optical unit 23, such as an electric power supply and signal ejection, is presented electrically through circuit board 23b and a flexible printed circuit board 53 (it omits the following FPC 53).
[0056] Thus, by having prepared one volume to one semiconductor laser, compared with the case where it is made to serve a double purpose, it is almost without error and output adjustment of each semiconductor laser can be ensured. Furthermore, since the operating distance of the fixture for volumes can be shortened in the output tuning of semiconductor laser by having approached and having formed volume 30 and volume 31, while being able to shorten working hours, it becomes good with a small small facility of an operating distance also about the adjustment facility which operates a volume adjustment fixture. Therefore, while being able to raise productivity, a facility configuration can be simplified, and a production cost can be reduced.
[0057] By setting these spacing at the time of approaching and preparing especially volume 30 and volume 31 to less than 10mm, since a fixture operating distance can be shortened further and an adjustment facility can also be miniaturized further, it is desirable.
[0058] Moreover, compared with the case where it prepares in the field close to the record medium of carriage 41, or the field of the opposite side, the projection of volume will contribute to thin shape-

ization of a part and the whole optical pickup which does not exist in the thickness direction of pickup, and becomes easy to realize the thin drive equipment which is the needs of a commercial scene by having prepared especially volume 30 and volume 31 in the flank of carriage 41, respectively.
[0059] Furthermore, since the operating distance of the fixture for volumes can be shortened in the output tuning of semiconductor laser by having stood in a row and prepared in the longitudinal direction (the direction of carriage of operation) of lateral portion 41a of carriage 41, while being able to shorten working hours, it becomes good with a small small facility of an operating distance also about the adjustment facility which operates a volume adjustment fixture. Therefore, while being able to raise productivity, a facility configuration can be simplified, while appearing notably about the effectiveness that a production cost can be reduced, it will contribute to thin shape-ization of the whole optical pickup, and the operation effectiveness of becoming easy to realize the thin drive equipment which is the needs of a commercial scene can also be acquired.
[0060] In addition, as shown in the gestalt of this operation, it is the carriage lateral portion which exists in the optical unit 21 side rather than the optical axis of the laser beam 24 by which outgoing radiation is carried out from the optical unit 23, and, as for volume 30 and volume 31, it is desirable that distance with the optical unit 21 and the optical unit 23 is prepared as much as possible in the short location.
[0061] Since distance between each optical unit and each volume can be shortened by arranging volume 30 and volume 31 to the lateral portion which satisfies such conditions Magnitude of FPC53 which has connected between these can be made small. Since area exposed to the field which counters especially the optical disk 1 of carriage 41, or its rear face can be made small, the possibility of the open circuit by FPC which may be generated with actuation on carriage 41 bending can be reduced greatly.
[0062] As for volume 30 and volume 31, it is still more desirable to be the field where the optical unit 21 is arranged, and a different field from all of the field where the optical unit 23 is arranged, and to be arranged on the same field.
[0063] By considering as such arrangement, output adjustment of semiconductor laser can be performed also to the midst which is adjusting the hand of cut of an optical unit (the plane of polarization of the laser beam by which outgoing radiation is carried out from an optical unit is adjusted to the predetermined sense). That is, since two activities can be done by the concurrency at a stretch, the working hours which the assembly of an optical pickup takes can be shortened, and a manufacturing cost can be reduced.
[0064] Next, it explains, referring to a drawing about the electrical installation of volume 30 and volume 31, and semiconductor laser. Drawing 9 is drawing showing the configuration of FPC in the gestalt of 1 operation of this invention. Drawing 10 is drawing showing the relation of the FPC and carriage in the gestalt of 1 operation of this invention.
[0065] There is a terminal which has taken out the signal from the light sensing portion which is carrying out the monitor of the light by which outgoing radiation is carried out from the terminal and semiconductor laser which supply power to semiconductor laser at least as a terminal applied to control of semiconductor laser among two or more terminal 21a prepared in the pars basilaris ossis occipitalis of the optical unit 21. Electric connection between such terminal 21a and circuit board 21b is made by joining the contact of terminal 21a and the print electrode currently formed in circuit board 21b with a pewter, conductive epoxy, etc.
[0066] in addition, the contact mentioned above is formed at the electrode which exists or is printed on circuit board 21b and the edge of terminal 21a which are formed by the electrode formed around the through tube prepared in circuit board 21b, and terminal 21a which penetrates the through tube.
[0067] And the electrode prepared in circuit board 21b and electrode 53a prepared in FPC53 are joined. In addition, the electrode prepared in this circuit board 21b may be used for connection with terminal 21a, may be formed in another location, and may be electrically connected to terminal 21a. In the gestalt of this operation, the electrode currently formed in electrode 53a, terminal 21a, and circuit board 21b of FPC53 is soldered to coincidence in the same location.
[0068] Furthermore, electrical installation of semiconductor laser and the light sensing portion for monitors, and volume 30 can be performed by joining electrode 53b with which the FPC53 is equipped,

and the polar zone of volume 30 with a pewter or conductive epoxy.
[0069] Moreover, there is a terminal which has taken out the signal from the light sensing portion which is carrying out the monitor of the light by which outgoing radiation is carried out from the terminal and semiconductor laser which supply power to semiconductor laser at least as a terminal applied to control of semiconductor laser among two or more terminal 23a prepared in the pars basilaris ossis occipitalis of the optical unit 23. Electric connection between such terminal 23a and circuit board 23b is made by joining the contact of terminal 23a and the print electrode currently formed in circuit board 23b with a pewter, conductive epoxy, etc. In addition, the contact mentioned above is what is formed by the electrode formed around the through tube prepared in circuit board 23b, and terminal 23a which penetrates the through tube, or is formed at the electrode currently printed on circuit board 23b, and the edge of terminal 23a.
[0070] And the electrode prepared in circuit board 23b and electrode 53c prepared in FPC53 are joined. In addition, the electrode prepared in this circuit board 23b may be used for connection with terminal 23a, may be formed in another location, and may be electrically connected to terminal 23a. In the gestalt of this operation, the electrode currently formed in electrode 53c, terminal 23a, and circuit board 23b of FPC53 is soldered to coincidence in the same location.
[0071] Furthermore, electrical installation of semiconductor laser and the light sensing portion for monitors, and volume 31 can be performed by joining 53d of electrodes with which the FPC53 is equipped, and the polar zone of volume 31 with a pewter or conductive epoxy.
[0072] Since the bending of FPC and generating of bending by actuation of carriage can be controlled compared with the case where it constitutes from two or more long and slender FPC by having constituted two or more semiconductor laser and the volume corresponding to each from one FPC as shown above, generating of malfunctions, such as an open circuit and contamination, can consider as an optical pickup with little high dependability.
[0073] Moreover, since this FPC53 is arranged so that the carriage 41 with which each optical member is arranged may be covered, it also has work of controlling penetration of the dust inside carriage, dust, etc. Therefore, it can consider as an optical pickup with little degradation of an optical property which adhesion of the dust to each optical member etc. cannot generate easily.
[0074] 32 is a superposition circuit for applying superposition to the semiconductor laser in the optical unit 21, and electrode 53e of FPC53 is connected through volume 30 from terminal 21a.
[0075] Moreover, it is also possible to prepare the circuit which superimposes a RF on the semiconductor laser of the optical unit 23 if needed.
[0076] In addition, volume 30 and volume 31 may make a volume 30 side conversely the volume for adjusting the laser intensity of the semiconductor laser in the optical unit 23, and may make a volume 31 side the volume for adjusting the laser intensity of the semiconductor laser in the optical unit 21. moreover -- the case where three or more semiconductor laser is prepared -- volume -- again -- semiconductor laser and same number ****** -- things are desirable.
[0077] Moreover, although the case where two or more optical units and volumes by one FPC are connected in the gestalt of this operation has been explained, even if it uses two or more FPC, predetermined effectiveness can be acquired, and lead wire may be used instead of FPC.
[0078] Next, the actuator which drives an objective lens 29 is explained. 33 is an objective lens maintenance cylinder and the objective lens 29 is fixing it to the objective lens maintenance cylinder 33 with means, such as adhesion. this objective lens maintenance cylinder 33 is [in / elastic maintenance is carried out with the wire 39 explained later, and / the predetermined range] movable -- it is free.
[0079] 34 is the permanent magnet magnetized by N pole at the objective lens 29 side, and 35 is York of a permanent magnet 34. It is fixed and this permanent magnet 34 and York 35 are not free movable like the objective lens maintenance cylinder 33.
[0080] 36 is a focal coil for driving the objective lens maintenance cylinder 33 in the direction of a focus, and 37 is a tracking coil for driving an objective lens 29 in the direction of tracking. These coils 36 and 37 are being fixed to the objective lens maintenance cylinder 33 by means, such as adhesion, in each. In the magnitude and the direction of a current which are passed in this permanent magnet 34, the

focal coil 36, and the tracking coil 37, it can always follow now in the direction of a focus, and the direction of tracking to a disk 1.

[0081] 38 is the junction substrate which supplies power to the focal coil 36 and the tracking coil 37, and this junction substrate 38 is attached in the both-sides side of the objective lens maintenance cylinder 33. Moreover, the junction substrate 38 is used also in order to hold the objective lens maintenance cylinder 33 in a center valve position with a wire 39. It is fixed to the junction substrate 38 by means, such as soldering, and the end of a wire 39 is being fixed by means, such as soldering, in the other end on the flexible substrate fixed to the end of the suspension electrode holder 40 by means, such as adhesion.

[0082] To an objective lens 29, a screw shaft 42 is constituted at the optical unit 23 side, the guide shaft 43 is constituted by the opposite side, and carriage 41 can move now the screw shaft 42 and guide shaft 43 top to a periphery from the inner circumference of a disk 1. At this time, the screw shaft 42 and the guide shaft 43 are arranged in abbreviation parallel, respectively. Furthermore, the suspension electrode holder 40, a permanent magnet 34, and York 35 are being fixed to carriage 41. Since the objective lens maintenance cylinder 33 is attached in the suspension electrode holder 40 through the wire 39 as mentioned above, it is held free movable to carriage 40 with the elasticity of a wire 39.

[0083] Furthermore, guide section 41c formed in one is engaging with carriage 41, and 41d of guide sections prepared in carriage 41 also like the guide shaft 43 is engaging with the screw shaft 42. Carriage 41 moves to radial [of a disk 1] smoothly by forming these guides sections 41c and 41d. Furthermore, the spiral slot is formed in the screw shaft 42, and, moreover, the rack 52 with the projected part which gets into said slot and is crowded is attached in carriage 40 through elasticity. Therefore, by guiding a rack 52 by rotation of a screw shaft 42 in the spiral slot of a screw shaft 42, in accordance with the shaft orientations of a screw shaft 42, driving force occurs on carriage 41, and carriage 41 moves in accordance with the shaft orientations of a screw shaft 42 with the driving force.

[0084] In drawing 1 and drawing 6 , the leading-about condition of the flexible substrate 7 for supplying power to the optical units 21 and 23 and the superposition circuit 32, the focal coil 36, and the tracking coil 37 between carriage 41 and a protective cover 44 And it is taken out in the direction of a periphery of a disk 1 from carriage 41, and the appearance which gives **** to a disk 1 side takes about, and it passes through between carriage 41 and a protective cover 44 again, is fixed with a fixed block 45 and the thrust spring 46, and is taken out outside from the module base 5. It seems that it is fixed by means, such as adhesion, and he sticks the back up plate to carriage 41 side face of a protective cover, and is trying not to hang down to the part which is not crooked in the part taken about after carriage 41 in the flexible substrate 7 here at a carriage side. Moreover, even when an optical pickup 3 goes to the diameter location of the outermost of a disk 1, from carriage 41, the tip of the back up plate does not separate from the back up plate of the flexible substrate 7, but it always overlaps.

[0085] Next, the feed section 4 is explained. The encoder 49 with which the motor shaft had come out of 47 to both ends by the feed motor, and the motor gear 48 was cut to one side, and it cut the slit to the other end at the circumferencial direction is attached by means, such as the thick close one. 50 is used in order to decelerate rotation of the feed motor 47 by the train gear. It is screw shaft gear, also in order to decelerate the rotational frequency of the feed motor 47, it is used, and it is fixed to a screw shaft 42 with means, such as the thick close one, and 51 is making rotation transmit.

[0086]

[Effect of the Invention] Since the volume for semiconductor laser quantity of light adjustment can be arranged on the field which arranged two or more optical units, and a different field and each adjustment volume spacing can be narrowed according to this invention as mentioned above, the miniaturization of an optical pickup is possible. Moreover, since the facility with the function to adjust each adjustment volume is close, a facility configuration is possible for simplification.

[Translation done.]